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MARITIME TRANSPORT IN THE MEDITERRANEAN: STATUS AND CHALLENGES

Overview of the sector.

Maritime transport is the backbone of trade and economic development (80% of goods are moved by maritime transportation. Global seaborne trade volume and demand for shipping services have been in constant - although moderate - growth after the 2008-2009 economic crisis. In 2015, for the first time, the world seaborne trade volumes exceeded 10 billion tons (UNCTAD, 2016). In 2017 the world fleet continued to grow (+3.15% in terms of deadweight tonnage (dwt) or + 2.47% in terms of number of vessels) compared to 2016 – but growth has been decelerating since 2011 (UNCTAD, 2017a).

As shown in *Fig. 1*, maritime routes are a function of obligatory points of passage, which are strategic locations that act as chokepoints

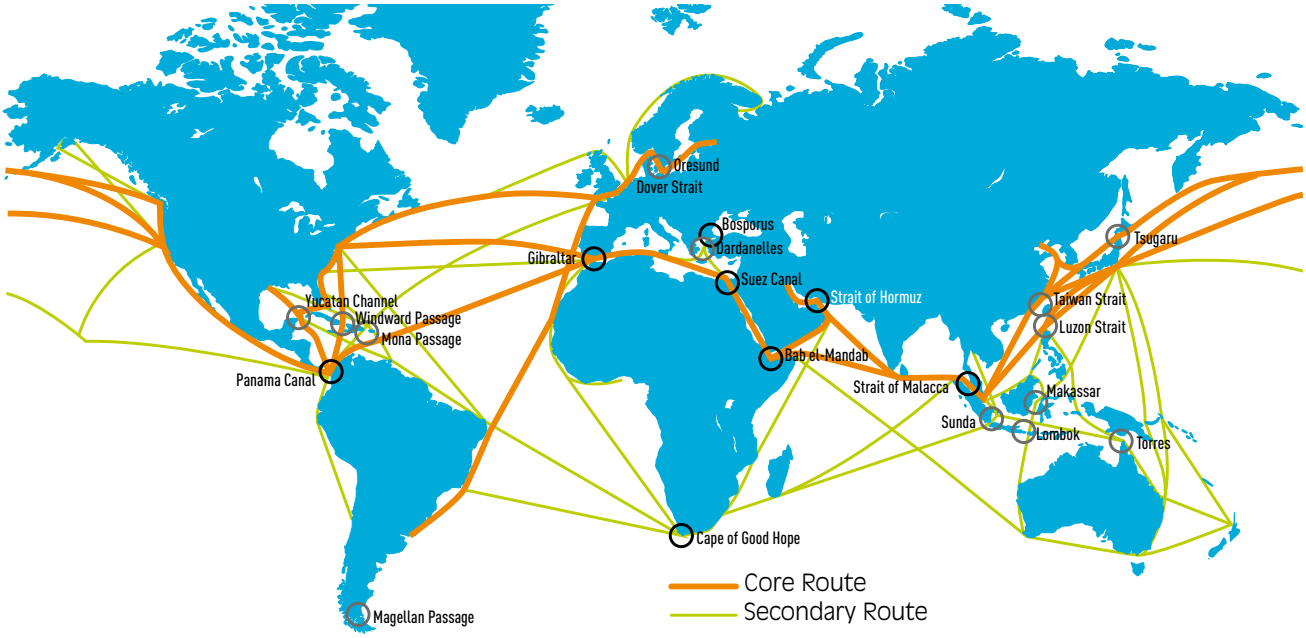

Fig. 1 - *Main Maritime Shipping Routes (Source: Rodrigue, 2017).*

(Jean-Paul Rodrigue, 2017). The Mediterranean Sea is located at the crossroads of three major maritime passages, namely the Strait of Gibraltar, opening into the Pacific Ocean and the Americas, the Suez Canal, a main shipping gateway which connects via the Red Sea - to Southeast Asia, and the Bosporus Strait, leading to the Black Sea and Eastern Europe/Central Asia.
With its strategic location, the Mediterranean hosts an important transit lane and trans-shipment activities for international shipping. It is also a busy traffic area due to Mediterranean seaborne traffic (movement between a Mediterranean port and a port outside the Mediterranean), and short sea shipping activities[1] (connecting two Mediterranean ports).

In terms of connections with the rest of the world, Europe (European port calls) is by far the main shipping connection for the Mediterranean, receiving about 40-50% of total extra-Mediterranean traffic (from ports outside the Mediterranean) (Arvis et al. 2019), as shown in *Fig. 3*.

The proportion of intra-Mediterranean traffic in total Mediterranean traffic rose from 49% in 2009 to around 58% in 2016. This increase was attributable to the growth of either trans-shipment or coastal or short-sea shipping (Arvis et al., 2019).

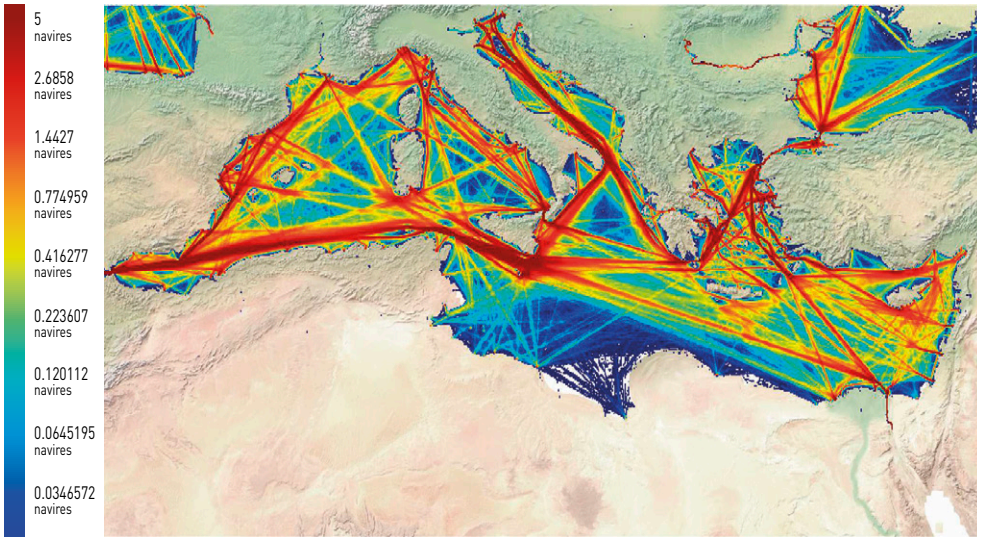

Fig. 2 - *Traffic density in the Mediterranean Sea Area (Source: INERIS, 2019).*

The Mediterranean fleet and flag registries.

Six Mediterranean coastal states are among the top 35 flag registry countries (by vessel capacity in dwt[2]) (UNCTAD, 2017a) as shown

BOX 1 Recent infrastructure developments influencing maritime traffic in the Mediterranean.

Suez Canal expansion: The Suez Canal connects the Red Sea with the Mediterranean Sea, offering ships a shorter route than travelling around Africa's southern tip. In 2015, Egypt launched a project to enhance the Suez Canal capacity and reduce transit time. The project included a new lane allowing two-way traffic and increased the Canal's capacity by 50%. The Canal can now accommodate the transit of 97 ships per day versus a reported average of 47 ships per day (Boske & Harrison, 2017), with expected traffic growth via the Mediterranean Sea (North and South). However, the latest statistics (2017) made available by the Suez Canal Authority show there was almost no increase in traffic (both in number of ships and volume) between 2015 and 2017 (Suez Canal Authority, 2017).

Panama Canal expansion: In June 2016, the Panama Canal completed its expansion with deeper docks, allowing larger ships to transit the Canal which makes about 79% of total deadweight tonnage in the global fleet able to use the Panama Canal (Boske & Harrison, 2017). This increased the competition with the Suez Canal for cargo movements between Asia and the North American east coast via the Red and Mediterranean Seas. Ships previously unable to transit through the Panama Canal have now an option for a shorter route and reduced delivery time from Asian ports located in the Pacific Ocean (East of Hong Kong). However, the Suez Canal can still accommodate larger ships than the Panama Canal and the route via the Suez Canal is the shortest one between North America and Asian ports located east of Hong Kong.

1 Trans-shipment is the transfer of goods (containers) from one carrier to another or from one mode to another.

2 *Dead weight tonnage* (dwt) is considered the relevant indicator for shipping trade versus *number of ships* because it is indicative of how much cargo a ship can carry.

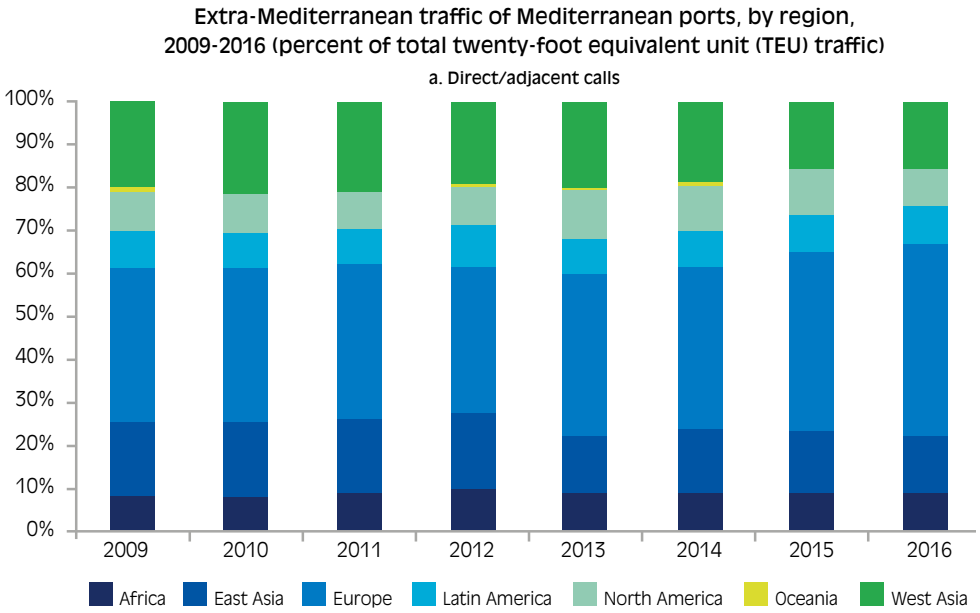

Fig. 3 - *Traffic density in the Mediterranean Sea Area (Source: Arvis et al., 2019).*

Country	Rank	Vessel capacity (in million dwt)
Malta	6th	99
Greece	9th	75
Cyprus	12th	34
Italy	17th	16
Turkey	26th	8
France	30th	4

Fig. 4 - *Flag registries- Ranking of Mediterranean Coastal States Source: (UNCTAD, 2017a).*

Country	Rank	Percentage of fleet registered under a foreign flag (%)
Monaco	14th	100
Turkey	15th	72
Italy	20th	29
France	28th	70
Cyprus	31st	64

Fig. 5 - *Ship-owning Countries. Ranking of Mediterranean Coastal States.*
Source: Table developed based on data from UNCTAD 2017 Review of Maritime Transport (UNCTAD, 2017a).

in *Fig. 4*. Malta, Greece and Cyprus are the three top flag registries in Europe. Ships registered under a national flag of a Mediterranean coastal State represent a total of approximately 13 % dwt of the total world dwt in 2017, largely owing to Malta (5.4%) and Greece (3.9%), followed by Cyprus (1.8%); Italy (0.9%) and Turkey (0.4%). Together, these five countries account for over 12% of the capacity in dwt of ships registered under Mediterranean coastal States' national flags.

Greece classifies as the top ship-owning country worldwide, followed by Japan, China, Germany and Singapore (UNCTAD, 2017a). These five countries accounted for 49.5% of the world's dwt in 2017. Aside from Greece, five Mediterranean coastal States are amongst the top 35 ship-owning countries (by vessel capacity in dwt), as shown in *Fig. 5*.

The Mediterranean coastal States have a total oil tanker capacity of 92,771 dwt, which represents 17% of the world's oil tanker capacity (534,855 dwt in 2017). Greece has the greatest oil tanker capacity (45,778 dwt), followed by Malta (29,199 dwt). The Mediterranean coastal States' bulk carrier capacity is of 103,765 dwt, which represents 13% of the total worldwide bulk carrier capacity (796,581 dwt in 2017). Malta has the greatest bulk carrier capacity (46,928 dwt in 2017), followed by Greece and Cyprus almost equally (23,079 dwt and 22,494 dwt respectively). General cargo ships of Mediterranean coastal States have a capacity of 7,688 dwt, which represents 10% of the total worldwide general cargo ship capacity (74,823 dwt in 2017).

Malta has the greatest general cargo ship capacity (2,229 dwt), followed by Italy (1,700 dwt). The Mediterranean coastal States' container ship capacity is of 25,923 dwt, which represents 10.5% of the total worldwide container ship capacity (245,609 dwt in 2017). Malta has the greatest container

Capacity of Mediterranean coastal States' fleet (2017, in dwt)	Capacity (in dwt)	Mediterranean / World (~%)
Total capacity	248,304	13
Oil tankers	92,771	17
Bulk carriers	103,764	13
General cargo ships	7,688	10
Container ships	25,923	11

Fig. 6 - *Mediterranean countries' fleet by main ship types (Source: UNCTAD, 2017b).*

ship capacity (16,198 dwt), followed by Cyprus (4,636 dwt) and France (2,341 dwt). The total capacity of the entire Mediterranean Coastal States' fleet (all ship types, including the above categories and other ship types such as gas/chemical carriers and ferries/passenger ships) accounts for 248,304 dwt, which represent 13% of the total worldwide ship capacity. Most Mediterranean coastal States' national fleet capacity have been steady or have grown in 2017. The most notable fleet capacity decreases in 2017 were recorded in Albania (-7.5%); Lebanon (-5.2%) and Turkey (-4.6%).

Oil transport. The Mediterranean is host to major oil transportation lanes, notably with oil shipments through 2 of the 6 major oil chokepoints worldwide. These are (i) the Suez Canal/SUMED Pipeline with 5.4 million barrels per day (b/d) of crude oil and petroleum in 2015, equivalent of about 9% of the world's seaborne oil trade, and (ii) the Turkish Bosporus and Dardanelles straits with 2.4 million b/d of crude oil and petroleum products in 2015 (U.S. Energy Information Administration (EIA), 2017). Together, the Suez Canal/SUMED Pipeline and the Turkish Straits accounted for 13% of the world's seaborne oil trade in 2015.

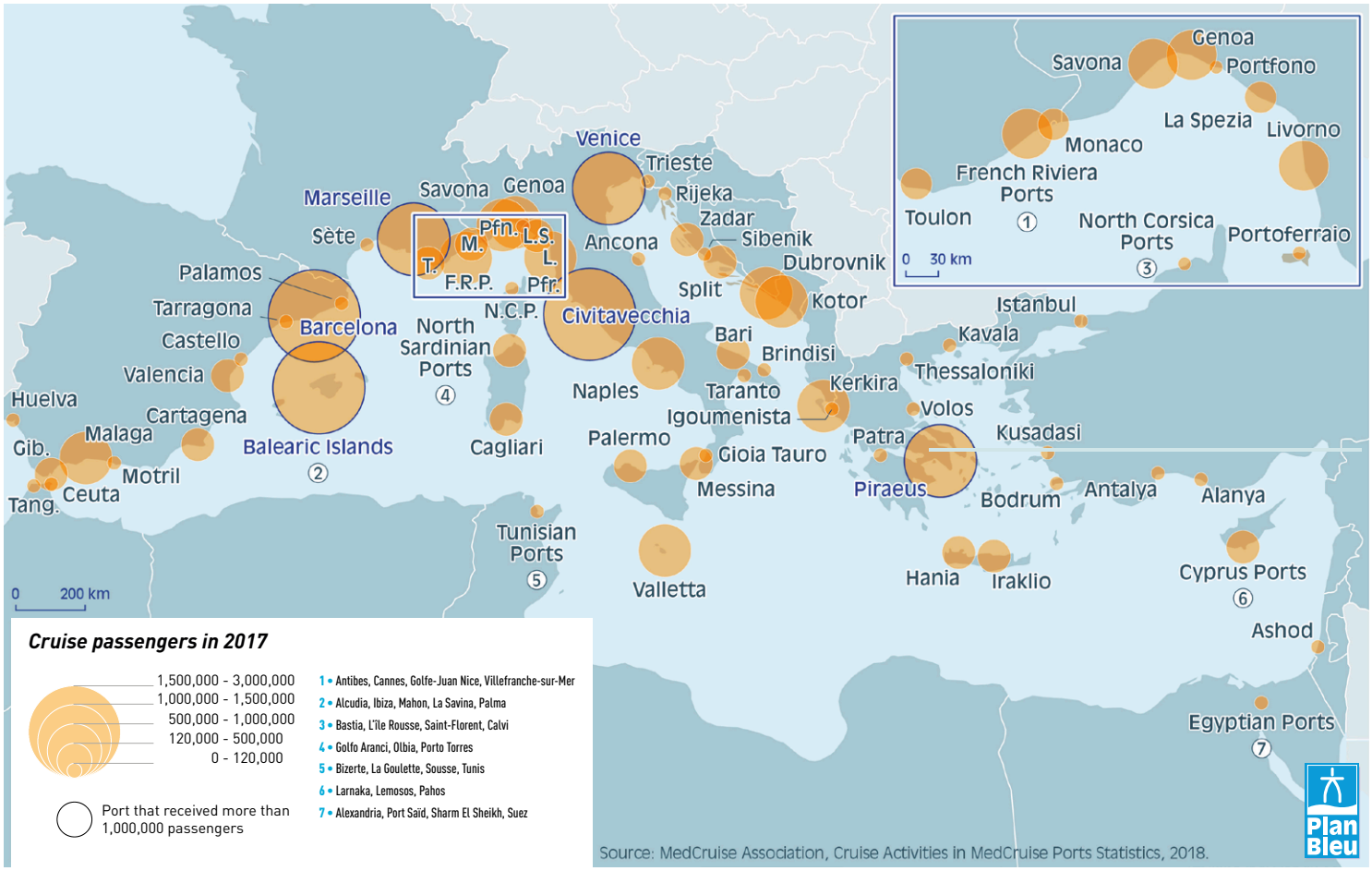

Fig. 7 - *Cruise passengers per cruise call in the Mediterranean, 2017 (Source: MedCruise, 2018).*

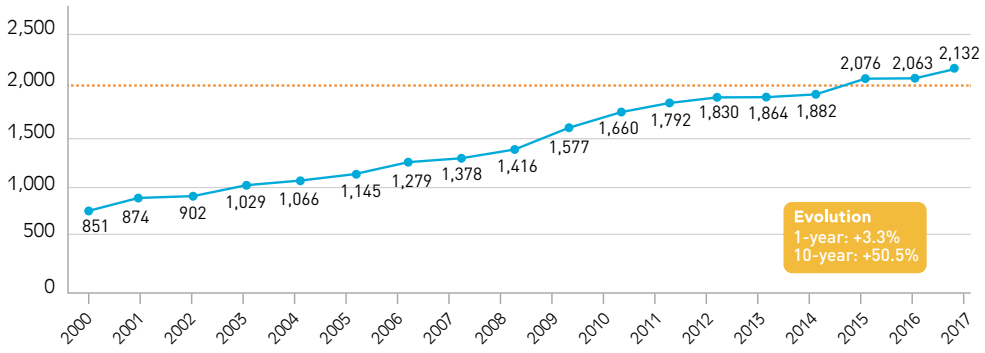

Fig.8 - *Average number of cruise passengers per cruise ship in the Mediterranean, 2000-2017 (Source: MedCruise Association, 2018).*

A fast-emerging cruise industry. The Mediterranean region has seen a significant and rapid rise in cruise ship movements over the last two decades: the number of individual cruise passengers in 2017 was over 4% higher than the number of passengers that cruised the previous year and more than double compared to 2006, when 12 million passengers cruised (MedCruise Association, 2018). Today, the region stands as the second biggest cruising region in the world (15.8% of global cruise fleet deployment in 2017 (idem)), after the Caribbean. Because of this continuous growth, ports are facing the challenge of providing proper infrastructure to accommodate large cruise ships and upgraded facilities to be able to accommodate an ever-growing number of cruise passengers as well as to collect and dispose of related waste. Ports accommodating more than 120,000 cruise passengers a year are considered major ports. 36 ports in the Mediterranean fall under this category, 25 of which being located in the Western Mediterranean area, seven ports in the Adriatic and four ports in the Eastern Mediterranean area. Ports with less than 120,000 cruise passengers in 2017 include 15 Western Mediterranean ports, eleven Eastern Mediterranean ports and six ports located in the Adriatic (MedCruise Association, 2018).

For three years in a row, Mediterranean cruise ports hosted, on average, more than 2,000 cruise passengers per cruise call *(Fig. 8)*. The increase from previous years is an indication of the continuous increase in the cruise shipping business in the Mediterranean region, but also of the increase in size of cruise vessels sailing in the Mediterranean (MedCruise Association, 2018).

Pressures on the environment.

Increasing shipping and maritime activities are significant drivers for anthropogenic pressure on the marine environment in the Mediterranean Sea. Pressures from maritime transport essentially include: potential accidental and illicit discharges of oil and hazardous and noxious substances (HNS); marine litter; water discharge and hull fouling; air emissions from ships; underwater noise; collisions with marine mammals; land take through port infrastructure; and anchoring. While accidental pollution and operational oily discharges have historically been the focus and appear to be under control due to a series of technical and regulatory measures implemented over the last two decades, marine bio-invasions, air pollution from ships and marine litter are today emerging as the three more pressing environmental challenges. Recently, underwater noise and marine mammal disturbance have been the subject of increasing international attention and action. See *Fig. 13* (DPSIR diagram) for an illustrative summary of the interaction of pressures with the marine and coastal environment.

Accidental and illicit discharges. Incident rates, and notably incidents involving oil, have decreased globally, including the Mediterranean, despite a steady increase in oil and other cargo volumes transported by ship. This can be attributed to the adoption and implementation of international maritime conventions addressing the safety of transportation as well as preparedness and response to accidents, following the Torrey Canyon oil pollution disaster in 1967. Between 1st January 1994 and 31 December 2013, approximately 32,000 tons of oil have been released into the Mediterranean Sea as a result of incidents. The number of incidents involving oil spills dropped from 56% of the total number of incidents for the period 1977 – 1993, to 40% for the period 1994 – 2013. Of these incidents, 61% resulted in a spillage of less than 1 tonne (REMPEC, 2014). In the Mediterranean, the quantities

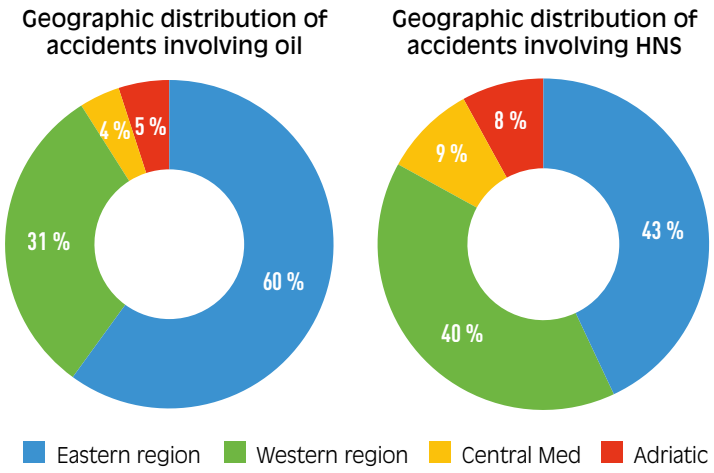

Fig.9 - *Geographical distribution of accidents (Source: REMPEC, 2014).*

of HNS accidentally spilled considerably decreased during the period 1994 – 2013. Since 2003, the release of HNS has become insignificant compared to the period 1994 – 2002. According to the findings of the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC), showing as *Fig. 9* the majority of incidents occurred in the Eastern Mediterranean area (REMPEC, 2014).

Oil spills and other hazardous substances lead to the reduction of plankton, physical damage to fish stocks, marine mammals and birds, resulting in general population decline[3].

For an effective response to accidental discharges, countries should agree to adopt recommendations set forth by the International Council on Clean Transportation (ICCT), UNEP/MAP and the EEA concerning the design of new engines and vessels as well as the use of cleaner fuels and onboard pollution control facilities[4].

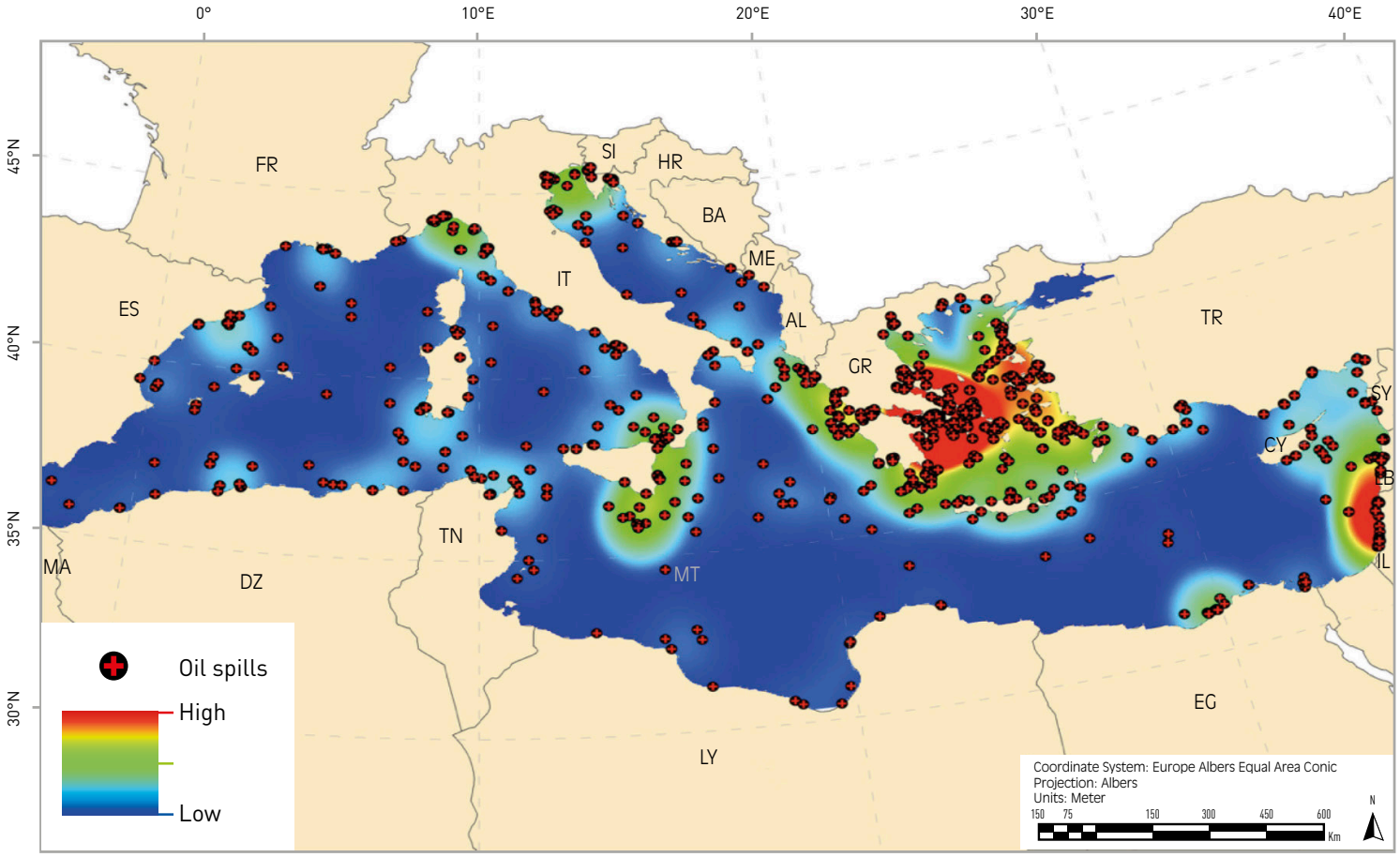

Fig.10 - *Main oil spills in the Mediterranean Sea, 1977-2017 (Source: Polinov, 2018 from REMPEC data).*

3 www.oilspillresponseproject.org/wp-content/uploads/2017/01/Impacts_on_marine_ecology_2016.pdf, p.15, 16 and 30.

4 Ameer Abdulla, PhD, Olof Linden, PhD (editors) (2008) *Maritime traffic effects on biodiversity in the Mediterranean Sea: Review of impacts, priority areas and mitigation measures.* Malaga, Spain: IUCN Centre for Mediterranean Cooperation, p. 166.

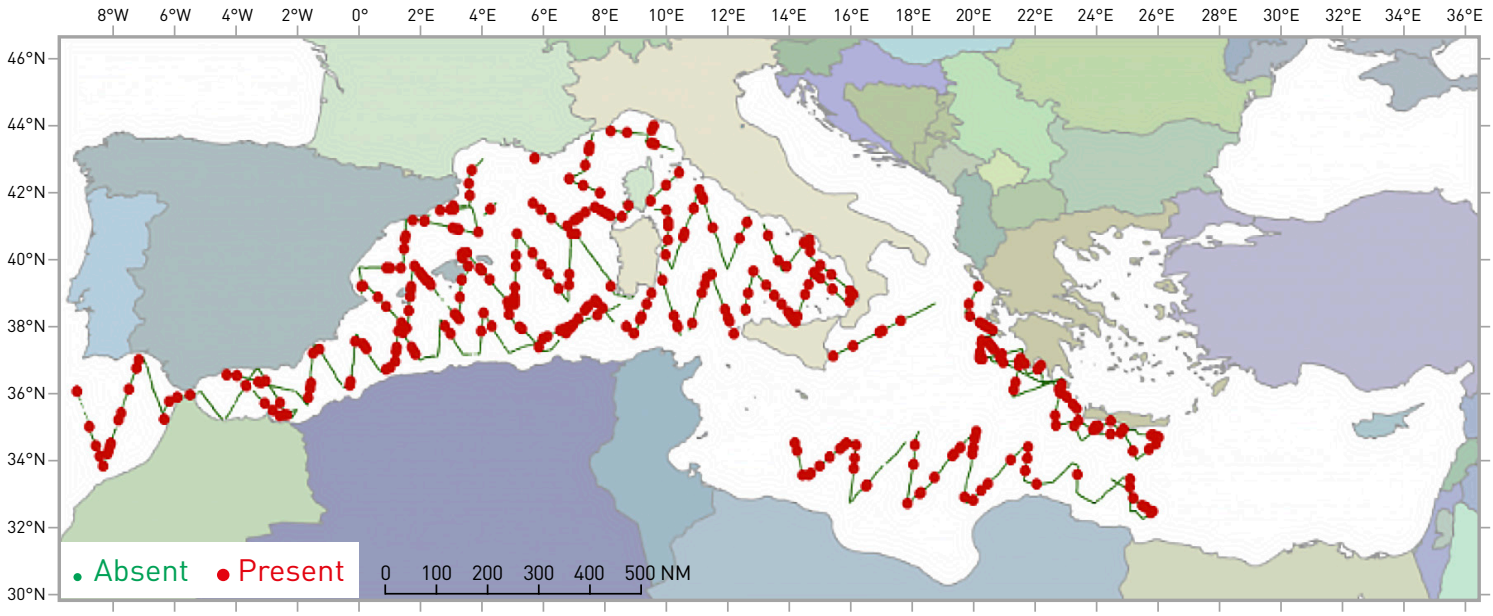

Fig.11 - *Passive acoustic surveying – anthropogenic noise: shipping* (Source: ACCOBAMS, 2018).

Furthermore, sustained efforts to control illicit oil discharges from ships are needed. Strict discharge regulations as well as the introduction of mandatory equipment and management procedures (required under MARPOL) have addressed operational discharges from ships such as sewage, garbage and cargo residues. However, illicit ship pollution discharges of oily water remain an issue, although increased regional cooperation for ship surveillance, data sharing, prosecution and port state control have proven effective. It is expected that sustained efforts and cooperation among Mediterranean States towards a better enforcement will contribute to minimising the occurrence of illicit ship pollution discharges. REMPEC's Alerts and Accidents Database contains a category for "Illicit Discharges". Only 5 cases were reported (1 in 2012, 1 in 2013 and 3 in 2015). The use of satellite imagery provides a better picture of the number of spills from ships. In 2016, the CleanSeaNet[5] platform of the European Maritime Safety Agency (EMSA) recorded, based on satellite imagery, a total of 1,586 of detections of probable pollution occurrences, and a total of 1,582 detections of possible pollution occurrences in EU coastal States, Iceland, Norway, Turkey and Montenegro. According to EMSA, the overall trend over most of the past decade has been a year-on-year reduction in the number of possible spills detected per million km² monitored. In 2016 this trend reversed, with an increase in the number of possible spills detected (EMSA, 2017). It is expected that sustained efforts and cooperation among the Mediterranean States towards a better enforcement will contribute to minimizing the occurrence of pollution from illicit discharges.

Marine litter. Although most marine litter in the Mediterranean originates from land-based sources, commercial fishing has been recognised as a sea-based source of litter, particularly fishing gear (UNEP/MAP, 2015). The litter from fisheries, such as nets, depletes fish stocks by continuously capturing fish (ghost fishing), and can also result in the transfer of NIS. Responses should focus on introducing mandatory measures concerning onboard litter management.

Ballast water released at sea and hull fouling facilitate the transportation and proliferation of non-indigenous species (NIS), over 1,000 of which are established in the Mediterranean, with the greatest impact felt in the Eastern Mediterranean[6]. NIS negatively impact the environment through predation and competition upon native species. The primary responses to tackle NIS from ballast water is the 2017 IMO International Convention for the Control and Management of Ships' Ballast Water and Sediments

5 https://www.cls.fr/en/

6 UNEP & MAP (2018) *Mediterranean 2017 Quality Status Report*, UNEP/MAP, p. 277

Impact	Effects on animal
Mortality	Death due to damage from sustained noise
Injury to tissues	Injury of gas-filled organs, such as the swim bladder; internal haemorrhaging, etc.
Damage to the auditory system	Rupture of hearing organs
Masking	Masking of sounds essential for species survival
Behavioural	Interruption of feeding, schooling, spawning, migration, etc.

Fig.12 - *Potential impacts of underwater noise on marine animals.*

(BWM Convention). On the other hand, the most relevant international response to reduce biofouling is IMO's voluntary GloFouling partnership project.
Overall, responses focus on the adequate management of ballast water and the periodic maintenance of hulls.

Air emissions from ships. Shipping activities have increased significantly over the last century, and, as such, are a known contributor to the global emissions of air pollutants and greenhouse gases (GHG). Ship emissions contain toxic gases and particulates like sulphur oxides (SOx) and nitrogen oxides (NOx). These, when released into the atmosphere, have adverse effects on human health and cause acidification of soil and the aquatic environment, impairing the life of fauna and flora. GHG emissions lead to ocean acidification, sea level rise, and temperature rise. GHG from ships, particularly carbon dioxides (CO_2) contribute to climate change. According to the 2014 third GHG study published by the IMO in 2014, shipping accounted for 2.2% of global CO_2 emissions in 2012. A recent study published by the International Council on Clean Transportation (ICCT) shows that shipping contribution to global CO_2 emissions has slightly increased (2.6% in 2015) (Olmer et al. 2017). Predictions indicate that by 2050, these emissions could grow by 50% to 250%, depending on economic growth and energy developments (IMO, 2015). The

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PRESSURES	STATE	IMPACT	RESPONSE
Water discharge & hull fouling	Number of NIS, location of discharge	Predation and competition on native species	Management of discharge, maintenance of hulls
Emissions	Amount of emissions	Sea level rise, ocean acidification, change of sea temperature	Reduction of emissions, RE-powered transport, carbon tax
Underwater noise	Distribution of underwater noise	Physical damage, behaviour change, population decrease of mammals	Speed limits, monitoring, technology upgrade
Oil spills	Reduction of plankton, fish stocks, marine mammals and birds	Reduction of plankton, fish stocks, marine mammals and birds	New engine of vessels, cleaner fuels, on-board pollution control
Collisions	Number of cetaceans killed by ships	Loss of cetaceans stock	Speed limits, monitoring, relocation of routes
Anchoring	Anchoring on sensitive marine habitats	Destruction of seabed habitats	Anchoring restricted zones
Land take: ports	State of marine environment in ports	Degradation of coastal ecosystems	Green ports
Marine litter from fisheries	Marine litter from fisheries	Reduction of fish stock,NIS	Management of litter from fisheries

Fig.13 - *Assessment of pressures exerted by maritime transport on the marine environment.*

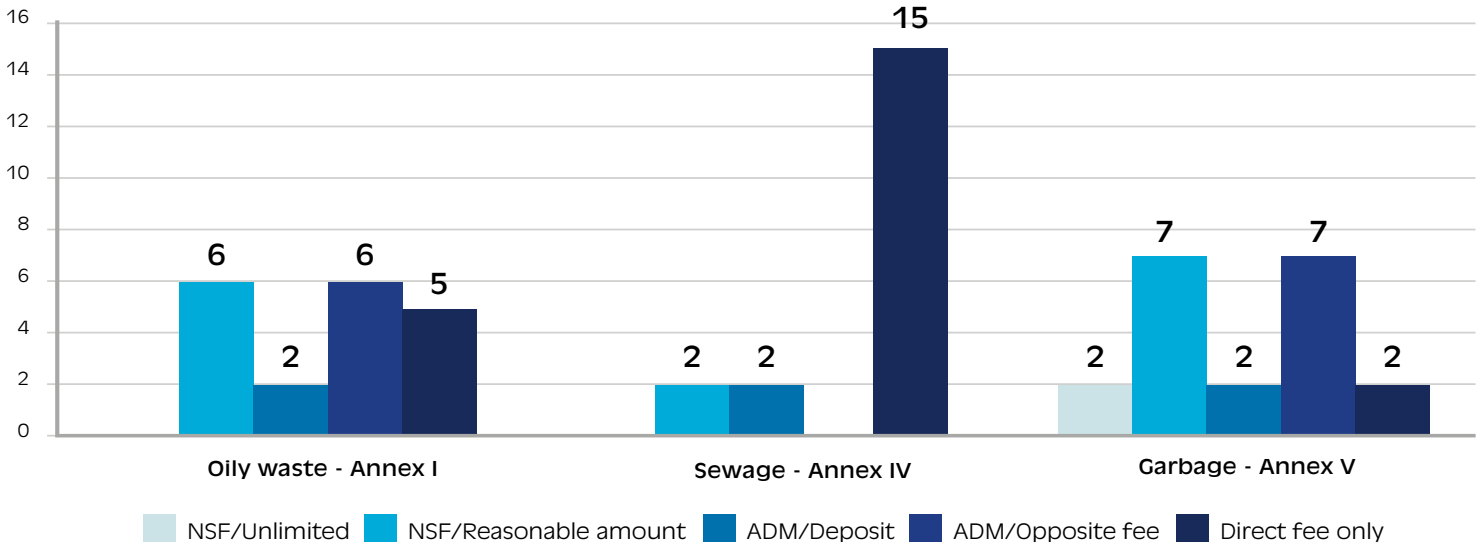

Fig.14 - *Types of fee systems used in EU ports located in the Mediterranean region (Source: UNEP/MAP, 2018).*

ecosystems of the Mediterranean Sea are specifically vulnerable to climate change and require urgent emissions reductions. The application of IMO global regulations establishing a sulphur cap in 2020 are expected to have curved air emissions, fostering low-sulphur and alternative fuels and energy. Further responses should adopt ambitious emission reductions with the upscale of transport powered by renewable energies and robust carbon taxes.

Underwater noise. As sound travels four times faster in water than in air, it affects the communication, behaviour, and overall health of marine species that are reliant on sound to survive, most notably cetaceans. Shipping is a significant source of underwater noise, which is mainly generated by propeller cavitation and on-board machinery (Nolet, 2017). The Mediterranean Sea, one of the world's busiest waterways, is deeply affected by underwater noise. Given the significance of shipping traffic taking place in the Mediterranean Sea, several attempts to predict or assess noise levels from vessels in the region have been carried out. A recent study published by ACCOBAMS[7] has identified and mapped several areas of high anthropogenic pressure in the Mediterranean region (noise hotspots)[8] including noise from shipping and port activities (Maglio, Pavan & Castellote, 2016). The initial data from the ACCOBAMS survey illustrates that underwater noise from shipping is considerably more abundant in the Western Mediterranean, although the coast of Greece is also a significant hotspot[9].

The most relevant impacts of underwater noise are behavioural changes, such as feeding and mating, that lead to population decrease; as well as physical damage, such as rupture of tissues and organs that can lead to death[10]. Despite the fact that many agreements acknowledge the issue of underwater noise, such as the Barcelona Convention, the GFCM, and the ACCOBAMS Agreement, no relevant response has led to effective adoption of minimum standards of quieting technologies nor speed limits to reduce underwater noise.

Collisions with marine mammals. About 220,000 vessels of over 100 tonnes cross the Mediterranean Sea every year, often navigating in autopilot day and night. Such vessels pose a significant risk of collision to marine mammals, specifically cetaceans that spend long periods of time at the surface[11]. A collision between a ship and a marine mammal can be caused directly by a ship crossing routes with a mammal in

7 Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic Area (ACCOBAMS).

8 Activities considered are: commercial and recreational marine traffic, harbour activities, commercial and scientific seismic surveys, oil and gas drilling activities, wind farms projects, military exercises.

9 http://www.accobams.org/main-activites/accobams-survey-initiative-2/asi-preliminary-results/

10 Hawkins A.D. and Popper A.N. (2016). *Developing Sound Exposure Criteria for Fishes. The Effects of Noise on Aquatic Life II.* New York. Springer: 431-439.

11 Panigada, S., Pesante, G., Zanardelli, M., Capoulade, F., Gannier, A. and Weinrich, M.T., 2006. Mediterranean fin whales at risk from fatal ship strikes. Marine Pollution Bulletin, 52(10), pp.1287-1298, p.1292.

motion, but it can also be caused by underwater noise from shipping activities, acting as sound masking, which interferes with mammals' communication and echolocation (Gerstein, Blue & Forysthe, 2006; Nolet, 2017). The risk of collision between ships and marine mammals is high in some parts of the Mediterranean Sea where there is intense shipping traffic (IUCN, 2012). Areas of particular risk for collision with cetaceans are the central part of the Ligurian Sea, areas off the Provencal coasts (Alleaume & Guinet, 2011) and the southern area of the Pelagos Sanctuary, the only pelagic Marine Protected Area (MPA) for marine mammals in the Mediterranean Sea (Pennino et al., 2017). The available quantitative data shows that ship strikes killed 16% of carcasses found between 1971 and 2000 (Panigada et al. 2006)[12].

However, studies also suggest that most strikes are unreported, and some indicate that ship strikes in Greece are responsible for 60% of whale deaths[13]. Hence, collisions with cetaceans can lead to a significant reduction of the cetacean population. Responses should focus on a basin-wide conservation strategy, including real-time monitoring of cetacean presence, relocation of ferry routes, and reducing ship speed in high-density cetacean areas.

Land take due to port infrastructure. Depending on the location, construction and operation of a port, it will imply modifications to water quality, coastal hydrology, marine and coastal ecology, leading to the degradation of coastal ecosystems due to bottom-sediment contamination. Authorities should minimise the impacts of the land-use change derived from port infrastructure by turning existing ports into green ports and building new port infrastructure based on environmental impact assessments.

Anchoring has a significant impact on keystone species present on the sea floor, such as *Posidonia oceanica,* and thus can lead to the destruction of seabed habitats. As a response, some local authorities, such as Port Cros, France, have emplaced anchoring restriction areas, especially in zones designated as environmentally sensitive[14].

Are we moving towards a blue economy?

Compared to road, rail and aerial modes of transportation, shipping is a low-cost, energy efficient and safe mode of transportation. As such, it has an essential role to play in achieving sustainable development and reaching the UN Sustainable Development Goals (SDGs) and targets to promote economic prosperity, while protecting the planet. IMO has established clear links between its work and the SDGs. The shipping industry has also embraced sustainable development by participating in the UN Global Compact initiative, a UN-led corporate sustainability movement in support of achieving the SDGs by 2030, and mapping opportunities in the sector to contribute to the SDGs (DNV-GL, 2017).

Ocean management. Marine Spatial Planning (MSP) provides a framework for arbitrating between competing marine human activities, including shipping, and managing their impact on the marine environment. The work achieved for the ongoing conservation and sustainable use of marine biodiversity in areas beyond national jurisdiction (BBNJ) through the development of a new legally-binding instrument under the United Nations Convention on the Law of the Sea (UNCLOS) is certainly relevant to fill in the gaps in the management and use of BBNJ. This work is expected to conclude in 2020.

Port Reception Facilities. In the Mediterranean, ahead of the adoption of the IMO action plan to address marine plastic litter from ships in 2018, sustained work has been carried out over the past decade to address ship generated waste. First, by prohibiting any discharge of garbage - under MARPOL Annex V special status and oily waste, in accordance with MARPOL Annex I, into the Mediterranean Sea area. Second, by promoting the availability of port reception facilities so that ships can dispose of their waste on shore for subsequent collection, processing, if needed, and final disposal. Third, following the adoption in 2013 of the Regional Plan for the Marine Litter Management of the Mediterranean, by promoting, within the framework of the EU-funded "Marine Litter-MED" Project, the application of charges at reasonable costs or, as applicable, a No-Special-Fee

12 Panigada, S., Pesante, G., Zanardelli, M., Capoulade, F., Gannier, A. and Weinrich, M.T., 2006. Mediterranean fin whales at risk from fatal ship strikes. Marine Pollution Bulletin, 52(10), pp.1287-1298, p.1292.

13 https://www.theguardian.com/environment/2018/may/27/shipping-routes-move-save-whales-greek-seas-dying-agony

14 Abdulla (n 85) p. 24.

Alternative fuel type	Potential CO_2 emission reductions
Advanced biofuels	25-100%
LNG	0-20%
Hydrogen	0-100%
Ammonia	0-100%
Fuel Cells	2-20%
Electricity	0-100%
Wind	1-32%
Solar	0-12%

Fig.15 - *Alternative fuels and potential energy and corresponding CO_2 emission reductions (Source: OECD/ITF, 2018)*

system for the use of port reception facilities by ships calling at Mediterranean ports - whether or not they use port reception facilities. This is in line with the EU Directive 2000/59/EC applicable to EU ports. As shown in the Figure below, some EU ports in Mediterranean Sea countries use a cost recovery system, either based on administrative fees (ADM) that are partly established based on the amount of waste delivered, or a Non-System Fee (NSF) that is charged to ships irrespective of their use of facilities, or direct fees that are only established based on the volumes of waste discharged.

Operational cooperation to address ship pollution illicit discharges in the Mediterranean. Cooperation amongst Mediterranean countries is key to coherently and effectively address illicit discharges from ships in the region. In recent years, joint work has included coordinated aerial surveillance operations and reporting, as well as agreeing on common methods for collecting, recording and documenting evidence. A Mediterranean Network of Law Enforcement Officials (MENELAS) relating to MARPOL within the framework of the Barcelona Convention was established in 2015 and an information system made available (http://www.menelas.org/). The challenge is to engage all Mediterranean countries in operational cooperation, which is subject to the availability of expertise and funding.

Alternative fuels and energy. There are emerging promising alternative fuel and energy options for potential reduction of GHG emission from shipping *Fig. 15*). Although not all of these alternatives are mature or readily available on the market, ships are increasingly looking at these especially for new builds or retrofiting.

Knowledge gaps. Integrated maritime data with a specific focus on the Mediterranean Sea remains scarce. Economic and shipping data (such as UNCTAD or Eurostat data and other databases or data analysis) often do not consider the Mediterranean as a whole. In most cases, Mediterranean coastal States are distributed among different geographical groups (Europe; Africa; Middle East) or are classified in groups according to their level of economic development. Another challenge is to keep databases and information systems up-to-date, given that maritime traffic characteristics (type of cargo transported; number, type and size of ship movements), port infrastructure developments and volumes of goods and passengers calling at ports can vary significantly over the years. There is also a gap in research and studies addressing all sources of pollution from ships and their specific impact on the Mediterranean Sea and coastal ecosystems, as defined in the Barcelona Convention. This lack of knowledge may be a challenge for shaping policy that would adequately address maritime transportation and its interaction with the marine and coastal ecosystem in the region.

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